Life Cycle of Oil and Gas: Abridged
Everything you need to know in 60 minutes or less

Lisa Hamil, CPL
Encana Oil & Gas (USA) Inc.
NADOA, Chicago, IL, September 2014
In the interests of providing Encana Corporation ("Encana" or the "Company") shareholders and potential investors with information regarding Encana, including management's assessment of Encana's and its subsidiaries' future plans and operations, certain statements contained in this presentation are forward-looking statements or information within the meaning of applicable securities legislation, collectively referred to herein as "forward-looking statements." Forward-looking statements in this presentation include, but are not limited to: projections contained in the 2012 Corporate Guidance (including but not limited to estimates of cash flow, including per share amounts, natural gas, oil and natural gas liquids ("NGLs") production, capital investment and its allocation, net divestitures, operating costs, and estimated 2012 sensitivities of cash flow and operating earnings); projections for 2013 (including but not limited to capital investment, net divestitures, net capital investment, natural gas, oil and NGLs and total liquids production, cash flow, net debt, and cash balance as of year-end); 2012 projected net debt and cash balance as of year-end; projection for long-term natural gas prices to reflect marginal supply cost; achieving a more balanced portfolio of production and cashflow; projected number of wells to be drilled in 2012 and their distribution among the Company's plays; projected percentage shift of capital investments to liquids rich plays from 2012 to 2013 and expected cash flow contribution from liquids production by 2013; the flexibility of capital spending plans and the sources of funding therefore; the ability to maintain investment grade credit rating; ability to attract new joint venture capital and implement existing joint ventures; projection to maintain current level of dividends; the effect of the Company's risk management program, including the impact of commodity price hedging in 2012 and 2013; projections, estimates and future plans and strategies for the Canadian and USA Divisions, various properties, plays basins and other assets, including liquids content and production growth for 2012-2013, PIIP, COIP, NGIP and EUR, target well cost, drilling, completion and tie-in ("DCT") costs, operating cost, transportation cost, drilling plans and well inventories, reductions in supply costs and estimates of reserves and economic contingent resources; forecast date of first natural gas production for Deep Panuke; projected coal to gas displacement for 2012 to 2013; expected coal unit retirements by 2025 and expected increase in potential natural gas demand; expected increase in natural gas demand from transportation; projected North American LNG export opportunity up to 2020, including from Kitimat LNG Project; short-, medium- and long-term projected increase in natural gas demand from various sources; projected North American natural gas production from 2012 to 2013, including by product types; projected future North American natural gas prices; projected U.S. and Western Canadian ethane and propane supply and demand up to 2017; and expectations for NGLs' prices, supply and demand in the future.

Readers are cautioned not to place undue reliance on forward-looking statements, as there can be no assurance that the plans, intentions or expectations upon which they are based will occur. By their nature, forward-looking statements involve numerous assumptions, known and unknown risks and uncertainties, both general and specific, that contribute to the possibility that the predictions, forecasts, projections and other forward-looking statements will not occur, which may cause the Company's actual performance and financial results in future periods to differ materially from any estimates or projections of future performance or results expressed or implied by such forward-looking statements. These assumptions, risks and uncertainties include, among other things: volatility of, and assumptions regarding natural gas and liquids prices, including substantial or extended decline of the same and their adverse effect on the Company's operations and financial condition and the value and amount of its reserves; assumptions based upon the Company's current guidance; fluctuations in currency and interest rates; risks that the Company may not conclude divestitures of certain assets or other transactions (including third-party capital investments, farms or partnerships, which Encana may refer to from time to time as "partnerships" or "joint ventures", regardless of the legal form) as a result of various conditions not being met; product supply and demand; market competition; risks inherent in the Company's and its subsidiaries' marketing operations, including credit risks; imprecision of reserves estimates and estimates of recoverable quantities of natural gas and liquids from resource plays and other sources not currently classified as proved, probable or possible reserves or economic contingent resources, including future net revenue estimates; marketing margins; potential disruption or unexpected technical difficulties in developing new facilities; unexpected cost increases or technical difficulties in constructing or modifying processing facilities; risks associated with technology; the Company's ability to acquire or find additional reserves; hedging activities resulting in realized and unrealized losses; business interruption and casualty losses; risk of the Company not operating all of its properties and assets; counterparty risk; downgrade in credit rating and its adverse effects; liability for indemnification obligations to third parties; variability of dividends to be paid; its ability to generate sufficient cash flow from operations to meet its current and future obligations; its ability to access external sources of debt and equity capital; the timing and the costs of well and retirement by 2025 and expected increase in potential natural gas demand; expected increase in natural gas demand from transportation; projected North American LNG export opportunity up to 2020, including from Kitimat LNG Project; short-, medium- and long-term projected increase in natural gas demand from various sources; projected North American natural gas production from 2012 to 2013, including by product types; projected future North American natural gas prices; projected U.S. and Western Canadian ethane and propane supply and demand up to 2017; and expectations for NGLs' prices, supply and demand in the future.

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Assumptions with respect to forward-looking information regarding expanding Encana's oil and NGLs production and extraction volumes are based on existing expansion of natural gas processing facilities in areas where Encana operates and the continued expansion and development of oil and NGL production from its existing portfolio within its asset portfolio. Forward-looking information respecting anticipated 2012 cash flow for Encana is based upon, among other things, achieving average production for 2012 of 3.0 Bcf/d of natural gas and 30,000 bbls/d of liquids, commodity prices for natural gas and liquids based on NYMEX $3.25 per Mcf and WTI of $95 per bbl, an estimated U.S./Canadian dollar foreign exchange rate of $1.00 and a weighted average number of outstanding shares for Encana of approximately 736 million. Forward-looking information respecting anticipated 2013 cash flow for Encana is based upon achieving average production for 2013 of between 2.9 Bcf/d and 3.1 Bcf/d of natural gas and 60,000 bbls/d to 70,000 bbls/d of liquids, commodity prices for natural gas and liquids based on NYMEX $3.50 per Mcf and WTI of $90 per bbl, an estimated U.S./Canadian dollar foreign exchange rate of $1.00 and a weighted average number of outstanding shares for Encana of approximately 736 million.

Furthermore, the forward-looking statements contained in this presentation are made as of the date hereof and, except as required by law, Encana undertakes no obligation to update publicly or revise any forward-looking statements, whether as a result of new information, future events or otherwise. The forward-looking statements contained in this presentation are expressly qualified by this cautionary statement.
Agenda

- Geoscience
- Land/Regulatory
- Engineering
  - Reservoir
  - Drilling
  - Completions
  - Facilities
- Current Issues
Geology 101
How do we know what we are looking for??

How many dinosaurs does it take to fill your tank?
Geoscience Overview

- Fundamentals of Petroleum Geology
  - Role of the Geoscientist
    - Exploration and Development Process
  - The Petroleum System
    - Reservoir
    - Traps
    - Source
  - Geoscience Toolbox
    - Mapping
    - Logging, Core Samples & Mudlogs
    - Seismic Data Acquisition
What they really do:

• **Exploration Phase:**
  – Identify areas of potential interest.
  – Assess petroleum system & play concept: Source, Maturity, Reservoir Type and Trap
  – Develop geological framework
  – Define basic rock, fluid and pressure properties
  – Estimate hydrocarbon volumes in place (OGIP & OOIP) and Estimated Ultimate Recovery (EUR)
  – Drill and evaluate test wells
What they really do:

• **Assessment Phase:**
  – Characterize reservoirs in greater detail: Geometry, continuity and variability
  – Refine Estimated Ultimate Recovery
  – Develop Drilling Plans
  – Select locations to drill
How Oil and Natural Gas are Formed

Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of silt and sand.

Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.

Today, we drill down through layers of sand, silt, and rock to reach the rock formations that contain oil and gas deposits.

*It's not from dinosaurs or poop
Where are the shale plays located?

http://jan.ucc.nau.edu/rcb7/nam.html
Early Mississippian 345 Ma

Bakken Deposition

http://jan.ucc.nau.edu/rob7/nam.html
Fundamental Concepts

- Oil & gas are found in sedimentary rocks
  - Rocks made up of particles
    - e.g. sandstones, limestones, shales
Fundamental Concept - 2
Porosity

Sedimentary rocks have pores
- Porosity- Ratio of space to rock volume
- Holes filled with water, oil or gas
- Controlled by grain size, sorting, shape, packing
- Cementation

http://www.alchata.es/ripple-marks/
Fundamental Concepts – 2
Permeability

• Space is great, but you need connections
• Permeability
  – Measure of the ability of a porous material to flow a fluid or gas

* Connected pores give a rock permeability.*
Types of Sedimentary Rocks

Seal
low perm
salt, shale

Reservoir
high P&P, sandstone

Source
organic rich
shale

http://www.geo.utexas.edu/faculty/marrett/SierraMadre.html

Dark black shale 2-14% organic content
Together these rocks form the petroleum system

The Petroleum System

RESERVOIR ROCK

SOURCE ROCK

CARRIER BED

SEAL

TRAP

Oil and Gas Traps

Conventional Oil and Gas Plays

A. Anticlinal trap

B. Fault trap

C. Stratigraphic trap

http://mpgpetroleum.com/fundamentals.html

Unconventional
How Wireline Logs Work

- Gamma Ray (GR)
  - Most marine organic matter has affinity for Uranium
- Caliper
  - Measures hole size
- Resistivity
  - Measures conductivity of formation in 3 depths of investigation
- Density Porosity
  - Measures the bulk density and calculates porosity
- Neutron Porosity
  - Measures amount of Hydrogen in the fluids and calculates porosity
- Image Logs
  - Ultra High Resolution resistivity log
Wireline Log and perforating equipment

Cased-hole wireline contractor preparing to rig-up
Wireline Tools

A

Instrumentation cartridge
Sonde
Integrated knuckle joint
Lower electrode

B

Flap
Pad
Two rows of 12 closely spaced electrodes

C

Top of hole
Electronics
Receiver section
Isolator
Far transmitter section

Top: 1 ft
11 ft
9-15 ft
10-16 ft
X & Y dipole
FM/ST dipole
R13 UM
L1 R1
Geology and DO’s
Land and Regulatory

Surface Issues

Land Acquisition Process
Types of Interests

Royalty

Surface

Minerals

NO LEASE – NO GREASE!
Land Acquisition Process
Land Acquisition Process

Joe Williams
100% Surface and Minerals
Leased to KMG

Larry Landseeker Family
100% Surface and Minerals
Not Leased

Larry Landseeker Family
100% Surface and Minerals
Leased to KMG
Land Negotiator Responsibilities

• Secures leases and approves lease payments
• Negotiates surface use agreement and makes surface payments
• Determines spacing unit for well(s)
• Initial site assessment and surveys
• Negotiates additional contracts and terms (farmouts, JOA’s)
• Provides all notices and communications to other necessary parties (WI owners, surface owners, parties within state mandated setbacks)
• Ensures obligations are met ahead of operation schedules
• Orders title and verifies ownership
• Works with regulatory on permitting
• Ensures JOA’s and AFE’s are sent to all WI owners
Surface Issues

- Drilling in Communities
- Drilling in Environmentally Sensitive Areas
  – Raptor, Sage Grouse, Wetlands
- Surface vs Mineral ownership
- Size of Drilling Pad
Sound and Light Protection
Completions Operations - ~10 acres
Reclaimed Pad Site - ~ ½ - 2 acres
Idealized Vertical Well Spacing

Well spacing can vary due to a number of factors including state regulatory requirements, location and formation characteristics.

Area shown is 1,280 acres
Well spacing can vary due to a number of factors including state regulatory requirements, location and formation characteristics.
Alternative Energy
Working With Regulatory

- Field Rules
- Spacing Units
- State and local Regulatory Agencies – Notices and Setback rules
- Federal/Indian Regulatory Agencies - Stips
- Permits Required to Drill
Where Are We in The Cycle?

We have:

• Determined geologically where we want to drill

• Met with and prepared stakeholders in the vicinity of the location for the drilling activity to come

• Obtained a valid mineral lease

• Agreements in place and permission to proceed from the surface owner

• The required State and/or Federal permits to proceed

• A drilling contractor under contract and a fit-for-purpose rig scheduled
Teamwork Approach – Engineering Process

- Reservoir – development plan to maximize economic benefit of oil & gas
- Drilling & Completion – provide access to the oil & gas
- Production & Midstream – move oil and gas from the well to sales point
Reservoir Engineer

- Reservoir Engineer
  - Reserves estimation
    - What is it and how much of “it” is there?
  - Production forecast
    - How much of it can be recovered and how long will it take to recover it?
  - Development plan
    - How many wells are needed?
    - Estimated Capital
    - Timing, spacing, area available to drill
  - Economics
    - What is the chance of success?
    - Will this make a profit?
    - Reporting to SEC and investors with reserve reports
  - Reservoir Engineers and DO’s
    - WI and NRI’s must be correct for reserve reports
Drilling Engineer

• Well Planning

  – Drilling Prognosis
    • How the well will be drilled and cased
    • Horizontal profile and directional plan
    • Bit selection, drilling fluid program, etc.

  – AFE’s
    • Estimating and minimizing costs
    • Negotiation of service contracts
    • Continuously review previous projects and use learnings to revise future project plans

  – Project Execution
    – Maintain frequent contact with the wellsite supervisor
      • Ensure that the prognosis is being followed as closely as possible
    – Decision making “on the fly”, mainly associated with solving problems
Oil and Gas Extraction

Well design

The design of oil and gas wells includes multiple layers of steel pipe (casing) and cement sheaths.
OK, We’re Ready to Drill – Now What?

- Major Steps
  - Prepare the location
    - Dirtwork (leveling, cutting, filling, surfacing)
    - Drill and case the conductor, or pilot hole
    - Drill the mousehole and rathole
    - Dig and line the reserve and working pits
  - Move in, rig up, & spud the well
  - Drill ahead and collect data
  - After TD (total depth) is reached, prepare the hole to run open-hole logs
    - Trip the bit back to bottom, circulate to clean the hole of any debris dislodged during logging, and trip the drill string out, laying down the drill pipe
  - Run, set, and cement the production casing or liner
  - Release the rig to move to the next location
Major Rig Components

A drilling rig is composed of four main systems plus the substructure:

1. **Hoisting** - derrick, crown, traveling block, drill line, and drawworks
2. **Drive** – motors, compounds, chains
3. **Circulating** – pits, pumps, standpipe, swivel, kelly, drill string, return lines, mud cleaning (shakers, desander, etc.)
4. **Well Control Equipment** – BOP’s and choke manifold
5. The **Substructure** provides stable support for the derrick and room to attach the BOP stack to the surface casinghead
Preparation Before Moving In Drilling Rig: Mousehole, Rathole, Conductor Hole
<table>
<thead>
<tr>
<th></th>
<th>Components of a Drilling Rig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crown Block</td>
</tr>
<tr>
<td>2</td>
<td>Catline Boom and Hoist Line</td>
</tr>
<tr>
<td>3</td>
<td>Drilling Line</td>
</tr>
<tr>
<td>4</td>
<td>Monkeyboard</td>
</tr>
<tr>
<td>5</td>
<td>Traveling Block</td>
</tr>
<tr>
<td>6</td>
<td>Top Drive</td>
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<tr>
<td>7</td>
<td>Mast</td>
</tr>
<tr>
<td>8</td>
<td>Drill Pipe</td>
</tr>
<tr>
<td>9</td>
<td>Doghouse</td>
</tr>
<tr>
<td>10</td>
<td>Blowout Preventer</td>
</tr>
<tr>
<td>11</td>
<td>Water Tank</td>
</tr>
<tr>
<td>12</td>
<td>Electric Cable tray</td>
</tr>
<tr>
<td>13</td>
<td>Engine Generator Sets</td>
</tr>
<tr>
<td>14</td>
<td>Fuel Tank</td>
</tr>
<tr>
<td>15</td>
<td>Electrical Control House</td>
</tr>
<tr>
<td>16</td>
<td>Mud Pumps</td>
</tr>
<tr>
<td>17</td>
<td>Bulk Mud Component Tanks</td>
</tr>
<tr>
<td>18</td>
<td>Mud Tanks (pits)</td>
</tr>
<tr>
<td>19</td>
<td>Reserve Pit</td>
</tr>
<tr>
<td>20</td>
<td>Mud-gas Separator</td>
</tr>
<tr>
<td>21</td>
<td>Shale Shakers</td>
</tr>
<tr>
<td>22</td>
<td>Choke Manifold</td>
</tr>
<tr>
<td>23</td>
<td>Pipe Ramp (V-door)</td>
</tr>
<tr>
<td>24</td>
<td>Pipe Racks</td>
</tr>
<tr>
<td>25</td>
<td>Accumulator</td>
</tr>
</tbody>
</table>

Collecting Rock and Fluid Data

- **Mud logs**
  - Gather and record rock and fluid properties while the well is being drilled by a geologist examining rock cuttings and drilling fluid using various instruments.

- **Open Hole Logs**
  - Gather and record rock and fluid properties after a well is drilled with tools run into the hole on a wire line.

- **Cores**
  - Tubular shaped rock samples are cut by special drill bits while drilling the well.
  - Smaller “sidewall” cores can be removed from the side of the borehole by special wireline tools after the hole is drilled.
Completion Engineer

• Planning
  – Develop Completion Procedure
    • Pick perforations based on open-log interpretation, mudlog data, test data, etc.
    • Run cased-hole logs to evaluate cement bond and design remedial work if necessary
    • Design frac job if necessary
    • Prepare completion procedure for wellsite supervisor
  – AFE’s
    • Estimate and minimize costs
    • Negotiate service contracts
    • Continuously review previous projects and use learnings to revise future project plans
Cased Hole Logging

• Cased Hole Logs
  – Gamma Ray Log
    • Used to assist in correlating casing collar locator log with open-hole logs
  – Cement Bond Log
    • Used to determine quality of bond and approximate top of cement behind casing
  – Casing Collar Locator
    • Used to get wireline tools “on-depth” for future operations
Perforating creates a series of holes through casing and cement and into the oil and gas reservoir rock to allow oil and gas to flow into a well.

The perforations are created by explosive shaped charges that are lowered into the well on an electrical wire line.
Perforating Gun
Hollow Perforating Charge Carrier

The hollow carrier is discarded following the job, having been riddled with holes when the gun fired.
Oil and Gas Extraction

Hydraulic fracturing ("fracing")

Creating small fractures in hydrocarbon bearing rocks to stimulate the flow of oil and natural gas

Steps to Hydraulically Fracture a Well

- Perforate holes in production casing along a stage (~200 ft)
- Pump frac fluid (water, proppant and additives) through the perfs
- Set a plug to isolate the stage just fractured
- Repeat steps 1, 2 and 3 along the lateral length
- Drill out the plugs with a coiled tubing unit
- Flow back to remove frac fluid

The well is now ready to produce

Note: Not to scale.
# Oil and Gas Extraction

## Hydraulic fracturing: Frac fluid additives

Frac fluid is comprised primarily of water and proppant (~99.5%)

<table>
<thead>
<tr>
<th>Additive</th>
<th>Primary Compound</th>
<th>Common Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diluted acid</td>
<td>Hydrochloric or muriatic acid</td>
<td>Swimming pools</td>
</tr>
<tr>
<td>Biocide</td>
<td>Glutaraldehyde</td>
<td>Dental disinfectant</td>
</tr>
<tr>
<td>Breaker</td>
<td>Ammonium persulfate</td>
<td>Bleaching hair</td>
</tr>
<tr>
<td>Crosslinker</td>
<td>Borate salts</td>
<td>Laundry detergents</td>
</tr>
<tr>
<td>Iron control</td>
<td>Citric acid</td>
<td>Food additive</td>
</tr>
<tr>
<td>Gelling agent</td>
<td>Guar gum</td>
<td>Biscuits</td>
</tr>
<tr>
<td>Scale inhibitor</td>
<td>Ethylene glycol</td>
<td>Antifreeze</td>
</tr>
<tr>
<td>Surfactant</td>
<td>Isopropanol</td>
<td>Glass cleaner</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proppant</th>
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</thead>
<tbody>
<tr>
<td>Sand</td>
</tr>
<tr>
<td>Ceramic</td>
</tr>
</tbody>
</table>

Note: Additive list adapted from, *Modern Shale Gas Development: A Primer*, (2009), U.S. DOE.
Production Engineers
Gathering & Midstream

• What is Gathering?
  – Handling and aggregating the products (oil & gas) until they reach a delivery point.

• What is Midstream?
  – All activities associated with handling the products from their first production at the well to a final sales point in a sellable form.

• Purpose:
  1. To move the gas and oil, ultimately to the final sales point
  2. Some conditioning of the product to meet different specifications
    • Pipeline & plant quality specs
    • Remove undesirable constituents,
      – Water
      – H₂S
      – CO₂
      – Solids
      – Heavy Hydrocarbons (Gas only)
      – Natural gas (Oil only)
    • Strip out valuable components
      – Ethane, Propane, Butane
Production Engineers

• Takes over after well has been drilled and completed.
• Works with gathering, midstream and facilities engineers to get product to market
• Responsible for well production for the life of the well
  – Refracing to different geologic zones
  – Recompleting wells
  – Routine maintenance and operations (sand, wax, loss of pressure, problems with casing, artificial lift, etc.)
• Wellbore Integrity Testing
• Plugging and Abandoning Well
Current Issues

Fracing

Land Grab
Why Oil and Gas?

Hydrocarbon_Man.MPG
### Everyday use of petroleum products

**A partial list of products made from Petroleum (144 of 6000 items)**

One 42-gallon barrel of oil creates 19.4 gallons of gasoline. The rest (over half) is used to make things like:

<table>
<thead>
<tr>
<th>Solvents</th>
<th>Diesel fuel</th>
<th>Motor Oil</th>
<th>Bearing Grease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ink</td>
<td>Floor Wax</td>
<td>Ballpoint Pens</td>
<td>Football Cleats</td>
</tr>
<tr>
<td>Upholstery</td>
<td>Sweaters</td>
<td>Boats</td>
<td>Insecticides</td>
</tr>
<tr>
<td>Bicycle Tires</td>
<td>Sports Car Bodies</td>
<td>Nail Polish</td>
<td>Fishing lures</td>
</tr>
<tr>
<td>Dresses</td>
<td>Tires</td>
<td>Golf Bags</td>
<td>Perfumes</td>
</tr>
<tr>
<td>Cassettes</td>
<td>Dishwasher parts</td>
<td>Tool Boxes</td>
<td>Shoel Polish</td>
</tr>
<tr>
<td>Motorcycle Helmet</td>
<td>Caulking</td>
<td>Petroleum Jelly</td>
<td>Transparent Tape</td>
</tr>
<tr>
<td>CD Player</td>
<td>Faucet Washers</td>
<td>Antiseptics</td>
<td>Clothesline</td>
</tr>
<tr>
<td>Curtains</td>
<td>Food Preservatives</td>
<td>Basketballs</td>
<td>Soap</td>
</tr>
<tr>
<td>Vitamin Capsules</td>
<td>Antihistamines</td>
<td>Purses</td>
<td>Shoes</td>
</tr>
<tr>
<td>Dashboards</td>
<td>Cortisone</td>
<td>Deodorant</td>
<td>Footballs</td>
</tr>
<tr>
<td>Putty</td>
<td>Dyes</td>
<td>Panty Hose</td>
<td>Refrigerant</td>
</tr>
<tr>
<td>Percolators</td>
<td>Life Jackets</td>
<td>Rubbing Alcohol</td>
<td>Linings</td>
</tr>
<tr>
<td>Skis</td>
<td>TV Cabinets</td>
<td>Shag Rugs</td>
<td>Electrician's Tape</td>
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<tr>
<td>Tool Racks</td>
<td>Car Battery Cases</td>
<td>Epoxy</td>
<td>Paint</td>
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<tr>
<td>Mops</td>
<td>Slacks</td>
<td>Insect Repellent</td>
<td>Oil Filters</td>
</tr>
<tr>
<td>Umbrellas</td>
<td>Yarn</td>
<td>Fertilizers</td>
<td>Hair Coloring</td>
</tr>
<tr>
<td>Roofing</td>
<td>Toilet Seats</td>
<td>Fishing Rods</td>
<td>Lipstick</td>
</tr>
<tr>
<td>Denture Adhesive</td>
<td>Linoleum</td>
<td>Ice Cube Trays</td>
<td>Synthetic Rubber</td>
</tr>
<tr>
<td>Speakers</td>
<td>Plastic Wood</td>
<td>Electric Blankets</td>
<td>Glycerin</td>
</tr>
<tr>
<td>Tennis Rackets</td>
<td>Rubber Cement</td>
<td>Fishing Boots</td>
<td>Dice</td>
</tr>
<tr>
<td>Nylon Rope</td>
<td>Candles</td>
<td>Trash Bags</td>
<td>House Paint</td>
</tr>
<tr>
<td>Water Pipes</td>
<td>Hand Lotion</td>
<td>Roller Skates</td>
<td>Surf Boards</td>
</tr>
<tr>
<td>Shampoo</td>
<td>Wheels</td>
<td>Paint Rollers</td>
<td>Shower Curtains</td>
</tr>
<tr>
<td>Guitar Strings</td>
<td>Luggage</td>
<td>Aspirin</td>
<td>Safety Glasses</td>
</tr>
<tr>
<td>Antifreeze</td>
<td>Football Helmets</td>
<td>Awnings</td>
<td>Eyeglasses</td>
</tr>
<tr>
<td>Clothes</td>
<td>Toothbrushes</td>
<td>Ice Chests</td>
<td>Footballs</td>
</tr>
<tr>
<td>Combs</td>
<td>CD's &amp; DVD's</td>
<td>Paint Brushes</td>
<td>Detergents</td>
</tr>
<tr>
<td>Vaporizers</td>
<td>Balloons</td>
<td>Sun Glasses</td>
<td>Tents</td>
</tr>
</tbody>
</table>
Myth #1: Hydraulic fracturing is a relatively new and untested process

Fact: Hydraulic fracturing is a proven technology that has been used for more than 60 years
Myth #2: Hydraulic fracturing is harmful to drinking water

“In the more than 60 years following those first [hydraulic fracturing] treatments, more than 2 million frac treatments have been pumped with no documented case of any treatment polluting an aquifer.”

– Kevin Fisher, Executive Vice-President, Flotek

Source: Energy in Depth

Fact: Effective wellbore design, proper execution, and monitoring, protect groundwater-bearing formations during completions operations
# Water usage for Fracing

## Table of Water Usage

<table>
<thead>
<tr>
<th>Sector</th>
<th>2010 Use (Acre-Feet/Yr)</th>
<th>Percent of State Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>16,359,700</td>
<td></td>
</tr>
<tr>
<td><strong>Agriculture</strong></td>
<td>13,981,100</td>
<td>85.5%</td>
</tr>
<tr>
<td><strong>Municipal and Industrial</strong></td>
<td>1,218,600</td>
<td>7.4%</td>
</tr>
<tr>
<td><strong>Total All Others</strong></td>
<td>1,160,000</td>
<td>7.1%</td>
</tr>
</tbody>
</table>

### Breakdown of "All Others"

<table>
<thead>
<tr>
<th>Category</th>
<th>2010 Use (Acre-Feet/Yr)</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total All Others</td>
<td>1,160,000</td>
<td></td>
</tr>
<tr>
<td>Recreation</td>
<td>923,100</td>
<td>5.64%</td>
</tr>
<tr>
<td>Large Industry</td>
<td>136,000</td>
<td>0.83%</td>
</tr>
<tr>
<td>Thermoelectric Power Generation</td>
<td>76,600</td>
<td>0.47%</td>
</tr>
<tr>
<td><strong>Hydraulic Fracturing</strong></td>
<td>13,900</td>
<td>0.08%</td>
</tr>
<tr>
<td>Snowmaking</td>
<td>5,300</td>
<td>0.03%</td>
</tr>
<tr>
<td>Coal, Natural Gas, Uranium, and Solar Development</td>
<td>5,100</td>
<td>0.03%</td>
</tr>
<tr>
<td>Oil Shale Development</td>
<td>0</td>
<td>0.00%</td>
</tr>
</tbody>
</table>
Myth #3: Hydraulic fracturing is not well regulated

<table>
<thead>
<tr>
<th>Industry Adopted Operating Practices</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracturing Fluid Additive Disclosure</td>
<td>Publicly disclose on a well-by-well basis the chemical ingredients in fracturing fluid additives used, including trade names, general purpose and concentrations</td>
</tr>
<tr>
<td>Fracturing Fluid Additive Risk Assessment and Management</td>
<td>Identify and manage the potential health/environmental risks associated with fracturing fluid additives and increase demand for more environmentally sound fracturing fluids</td>
</tr>
<tr>
<td>Baseline Groundwater Testing</td>
<td>Develop domestic water well testing programs and participate in regional groundwater monitoring programs</td>
</tr>
<tr>
<td>Wellbore Construction and Quality Assurance</td>
<td>Ensure the proper design and installation of the wellbore, confirm wellbore integrity prior to initiation of hydraulic fracturing operations, and develop remedial plans in the unlikely event that the wellbore is compromised</td>
</tr>
<tr>
<td>Water Sourcing, Measurement and Reuse</td>
<td>Evaluate available water source options, monitor water sources as required to demonstrate sustainability of the resource, and measure and report water withdrawals</td>
</tr>
<tr>
<td>Fluid Transport, Handling, Storage and Disposal</td>
<td>Identify, evaluate and mitigate potential risks related to the transport, handling, storage and disposal of fluids, and ensure a quick response to accidental spills</td>
</tr>
<tr>
<td>Anomalous Induced Seismicity</td>
<td>Where appropriate, establish monitoring, mitigation and response procedures to avoid or minimize any adverse effects of induced seismicity associated with hydraulic fracturing</td>
</tr>
</tbody>
</table>

Fact: Hydraulic fracturing is highly regulated by federal, state, and local agencies
Industry Regulation

- Major Regulations Covering O&G Operations
  - Air: Clean Air Act (CAA)
  - Water: Clean Water Act (CWA)
  - Spill: Oil Pollution Act
  - Waste: Resource Conservation and Recovery Act (RCRA)
  - OSHA: Occupational Safety and Health Act
  - “Regulatory: or Well Permitting
  - Local (County/City)
Earthquakes

- Believed to be caused by wastewater injection wells
- Amount of seismic energy released is equivalent to a gallon of milk falling off of your kitchen counter.
- Measure fracturing with microseismic
- Hairline fractures that are held open with a grain of sand
Federal Land “Grab”

- The BLM manages nearly 700 million acres of mineral estate. This acreage includes areas where either the BLM or other federal agencies manage the surface, as well as areas where the surface is privately owned.
- Of the 700 million 166 million have been withdrawn from mineral entry and sale, leaving 534 million acres. Currently there are 12,512,974 acres of federal lands currently producing. This equates to 2.3% of all federal lands available.
- More than 70 percent of American oil shale — including the thickest and richest deposits — lies on federal land, primarily in Colorado, Utah, and Wyoming. These federal lands contain an estimated 1.23 trillion barrels of oil — more than 50 times the nation's proven conventional oil reserves. (www.blm.gov)
Production

• “I’m proud of the fact that under my administration, oil production is higher than it has been in a decade or more. President Obama, February 20, 2013

• However, there has been a 15% decrease in onshore production of oil and natural gas on federal lands in the last two years.
Federal Leasing

Oil and Gas Statistics by Year for Fiscal Years 1988 - 2012

Return to Main Oil and Gas Statistics Page »
Permitting

Oil and Gas Statistics by Year for Fiscal Years 1988 - 2012

Return to Main Oil and Gas Statistics Page »
Legislative Issues 2014

- Initiative 121 - Fairness

**Summary:** Initiative 121 states that any local government including county, municipality or special districts that enacts a suspension, moratorium, or ban prohibiting the production or permitting of oil and gas development will not be eligible to receive oil and gas state tax funds. If the local government lifts the ban the local government’s share of tax revenue will be restored. Local governments are prohibited from receiving funds under this section and will not receive offsetting state funds from other sources.

- Initiative 137 - Fiscal Impact Statements

**Summary:** Initiative 137 will require that a fiscal impact estimate is filed along with the filed initiative. The impact estimate will look at the effects the measure will have on state and local government revenue, expenditures, taxes and fiscal liability. The fiscal impact estimate must be submitted to Legislative Council and the Secretary of State. After the impact estimate is submitted to the title board, the Director of Research of Legislative Council will prepare an impact statement taking into consideration the impact estimate along with information from other government departments and interested parties. Once the initiative passes the title board process the petitions must include the fiscal impact abstract. The abstract is a summary of the fiscal impact statement. It must also include any impact to the average voter. The ballot information book will have the fiscal impact statement and the abstract prepared for the initiatives.
QUESTIONS??